



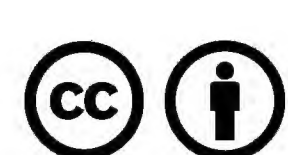
Taxonomic revision of the Australian native bee subgenus *Callalictus* (Hymenoptera: Halictidae: Halictini: genus *Lasioglossum*)

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Abstract

The Australian *Lasioglossum* Curtis 1833 subgenus *Callalictus* Michener 1965 is revised. Of the eight available names listed by Michener (1965), four are placed in synonymy and one species is recombined into *Lasioglossum* (*Austrevylaeus* Michener 1965) providing three valid species for the subgenus *Callalictus*.

New synonymies and valid and recombined names proposed for *Lasioglossum* (*Callalictus*) are as follows: *Lasioglossum* (*Callalictus*) *tooloomense* (Cockerell 1929a) **syn. nov.** = *Lasioglossum* (*Callalictus*) *aurantiacum* (Cockerell 1916); *Lasioglossum* (*Callalictus*) *ruficollis* (Friese 1924) **syn. nov.**, *Lasioglossum* (*Callalictus*) *rufo-collare* (Cockerell 1930) **syn. nov.** and *Lasioglossum* (*Callalictus*) *anomalum* (Rayment 1935) **syn. nov.** = *Lasioglossum* (*Callalictus*) *callomelittinum* (Cockerell 1910); *Lasioglossum* (*Callalictus*) *musgravei* (Cockerell 1929b) is valid; and, *Lasioglossum* (*Callalictus*) *contaminatum* (Cockerell, 1929b) **comb. nov.** is moved to *Lasioglossum* (*Austrevylaeus*) *contaminatum*. Males of two *Callalictus* species have highly modified fore and mid tarsal segments.

All valid species are redescribed, and keys to both sexes, montaged diagnostic images and distribution maps are provided to assist with species identifications.

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Introduction

Halictidae is the second largest bee family in the world, with almost 4,500 species (Danforth *et al.* 2019), and is found on all continents except Antarctica (Michener 2007). Most species belong in the tribe Halictini, which has over 2,800 species (Ascher and Pickering 2022) and occurs in most terrestrial habitats.

Lasioglossum Curtis 1833 is one of the most species-rich and taxonomically challenging groups of all world bee genera, with up to 1,800 named species (Michener 2007; Gibbs *et al.* 2012). *Lasioglossum* bees are distinguished from other Halictini genera by having the third submarginal (2nd r-m; ‘*Lasioglossum* series’) and sometimes the second submarginal crossveins (1st r-m; ‘*Hemihalictus* series’) weaker than the first submarginal crossvein (Michener 2007). Danforth (1999) found that *Lasioglos-*

sum was monophyletic and that the Australian subgenus *Chilalictus* was the basal taxon of *Lasioglossum sensu lato*. Species within this global genus are generally small to moderate sized bees (3.5 mm to 12.5 mm) with colourations ranging from metallic blue to greenish to non-metallic black or red and a few with ochre colouration (Michener 2007).

The subgeneric classification of *Lasioglossum* has attracted much ongoing debate (Ebmer 1978; Pesenko 1986; Danforth 1999; Michener 2007; Gibbs 2010; Gibbs *et al.* 2012, 2013) with the number of proposed subgenera ranging from 32 (Pesenko 1986) down to 17 (Michener 2007; Zhang *et al.* 2022). The Australian component of this most diverse genus within the Halictidae currently has 266 available names. In Australia, *Lasioglossum* is divided into eight subgenera as follows: *Australictus* Michener 1965 (11 species); *Austrevylaeus* Michener 1965 (six species); *Callalictus* Michener 1965 (eight species); *Chilalictus* Michener 1965 (139 species); *Ctenonomia* Cameron 1903 (nine species); *Glossalictus* Michener 1965 (one species); *Parasphecodes* Smith 1853 (92 species), one metallic species of *Parasphecodes* occurs in New Guinea (Michener 1965); and, *Pseudochilalictus* Michener 1965 (one species) (ABRS 2022a). Most subgenera are endemic except there are several species of *Austrevylaeus* in New Zealand (the New Zealand species do not occur in Australia (Donovan 2007)), several species of *Chilalictus* in the Pacific Islands (some of these species do occur in Australia (Pauly *et al.* 2013)) and *Ctenonomia* is primarily an African and Asian subgenus with several species in Australia (Michener 2007).

Debate also continues about the relationship between *Lasioglossum* and *Homalictus* Cockerell 1919. Some authors place *Homalictus* at generic rank (Michener 2007, Gollan *et al.* 2011; Niu *et al.* 2013; Pauly *et al.* 2015; Groom *et al.* 2017; Grieve *et al.* 2018; Hall 2018; Houston 2018; Dorey *et al.* 2019) while others contend molecular studies show *Homalictus* is better placed as a subgenus of *Lasioglossum* (Danforth 1999, Danforth *et al.* 2001, 2003, 2008; Gibbs *et al.* 2012, 2013; Zhang *et al.* 2022). Here, *Homalictus* is treated as a valid genus with 46 Australian species (ABRS 2022b).

The subgenus *Callalictus*, with eight available names, is a discrete *Lasioglossum* subgenus of the Australian bee fauna. It has a limited range from Queensland, down coastal New South Wales, across Victoria and just into South Australia (Figs 1A–C). Bees of this subgenus are rarely collected, as evidenced by only 124 specimens located in Australian institutions and used in this study. This compares to the over 35,000 specimens located for the *Lasioglossum* (*Chilalictus*) taxonomic revision (Walker 1995), the most common Australian *Lasioglossum* subgenus with an Australia wide distribution. One species of *Callalictus* dominated these 124 specimen records with 110 records for *Lasioglossum* (*Callalictus*) *callomelitinum* (Cockerell 1910). This species is distributed from SE Queensland to SE South Australia (Fig. 1B). All other

species of the subgenus *Callalictus* are restricted to Queensland and New South Wales (Figs 1A, C). The Atlas of Living Australia (ALA 2022) website has 169 records for the subgenus *Callalictus* with 24 records derived from citizen science websites.

A full morphological diagnosis for the subgenus *Callalictus* is provided. Species can be generally distinguished from other Australian *Lasioglossum* subgenera by these characters: body length moderately large (6.7 mm to 9.1 mm) with prominent and pointed dorsolateral angles of the pronotum (Figs 3A, 4A, 5A); body colours range from black to ochre, one species with a red-brown mesoscutum (Figs 3A–D, 4A–D, 5A–D); labrum of female tapers to a point and margins unmodified; female basitibial plate pointed, absent on males and female inner hind tibial spur pectinate. Male genitalia with gonostyli well developed and densely setose (Figs 2A–F), in one species the gonostyli are bifid (Figs 2C–D). Males of two species with distinctive sternal vestiture (Figs 4F, 5F) and males of two species have their fore tarsal segments apically bilobed, horizontally compressed, flattened, weakly convex dorsally and with lateral hair tufts on each segment (Figs 3D–E, 5D–E). When viewed ventrally, these modified tarsal segments are dark coloured with a pale white coloured line running down the middle of each segment.

The Australian *Lasioglossum* subgenus *Callalictus* is revised. Of the eight available names listed by Michener (1965), four are placed in synonymy and one species is recombined into a different *Lasioglossum* subgenus, providing three valid species for the subgenus *Callalictus*. All species are redescribed, and keys to both sexes, montaged images and distribution maps are provided to assist with species identifications.

Methods

Terminology follows Michener (2007). To assist with the descriptions the following notes are provided: relative head measurements were standardised to a head width of 100 units; absolute measurements are expressed as minimum-mean-maximum where multiple specimens were available; body length is measured from antennal sockets to apex of metasoma; forewing length was measured from the base of the arcuate basal vein (vein M) to the distal most margin of the third submarginal cell (vein 2nd r-m); intertegular distance was measured as the greatest distance between wing tegulae. Sculpture nomenclature follows Harris (1979). Mesoscutum punctation nomenclature is as follows: dense – interspaces between punctures less than diameter of a puncture; close – interspaces between punctures equal to diameter of puncture; open – interspaces between punctures greater than 1 times but less than 2 times diameter of puncture; sparse – interspaces between punctures equal to or greater than 2 times diameter of puncture. To standardise the description of the mesoscutum punctation, the mesoscutum was subdivided into areas

as follows: anteromesial – area along the leading edge of the mesoscutum and on each side of the midline; anterolateral – area on the anterior lateral corners of the mesoscutum; mesial – area between parapsidal lines; parapsidal areas – areas between parapsidal lines and nearest lateral margin; laterad of parapsidal lines – area adjacent to the outer margin of the parapsidal lines; mesiad of parapsidal lines – area adjacent to the inner margin of the parapsidal lines; posterior – area along the posterior margin of the mesoscutum (see Michener 2007, p. 49, fig. 10-5b).

Due to the importance of vestiture as diagnostic characters on the male *Lasioglossum* genital capsule, in particular on the gonocoxite, retrorse lobes and gonostyli, a decision was made to photograph dry mounted capsules rather than the usual method of photography in glycerol. Treatment of the genital capsule was as usual: specimen placed in humid chamber for 24 hours, removal of capsule using a hooked pin, 24 hours in 10% KOH, several water washes but then the capsule was placed on tissue paper and allowed to dry for several hours. A Micro-Headless Pin B3 (0.193 mm x 15 mm) was pinned to a piece of foam attached to an A3 entomological pin so that the blunt end of the micropin was pointing out. A droplet of water-soluble glue was placed on the end of the micropin and the micropin blunt end was brought into contact with the left side basal corner of the gonobase and allowed to dry. It is important when drying to position the genital capsule underneath the micropin in a horizontal position otherwise the genital capsule can move down and around the micropin. Ventral and dorsal montaged images were taken against a black background to highlight diagnostic vestiture and structures. The micropin and genital capsule were then attached to the specimen's pin. A decision was made to exclude images of the 7th and 8th sternal segments. These two sterna were similar in shape and vestiture across all three valid species and offered no unique diagnostic characters.

Body and head measurements were taken using a Zeiss Stemi 2000-C microscope. Images were taken using a Leica M205C microscope with a Leica DFC500 c-mount camera controlled by the Leica LAS Version 3.8 to create image montage stacks. Montaged images were created using Helicon Focus 5.3 which were then post-processed and image plates formed using Adobe Photoshop 6.

Terminology associated with flight activity follows that of The Torre-Bueno Glossary of Entomology (Nichols et al 1989): crepuscular – "active or flying at dusk", diurnal – "active or habitually flying by day", matinal – "of or in the morning", "nocturnal – "active at night". Flight and floral visitation data were recorded from labels of specimens examined in this study.

Abbreviations used in the text are as follows: HW – head width; HL – head length; UID – upper interorbital dis-

tance; LID – lower interorbital distance; IAD – interantennal distance; IOD – interocellar distance; OAD – ocellantennal distance; OOD – ocellocular distance; CL – clypeal length; GW – genal width; EW – eye width; FL – flagellar length; AS4 – antennal segment four length; AS2+3 – antennal segments two plus three lengths; S1-S8 – metasomal sterna 1-8; T1-T6 – metasomal terga 1-6; UID – upper interorbital distance; SE – South East.

This study was based on examination of 124 specimens (and several citizen science images posted on Facebook – links within species descriptions) from the following collections: AM – Australian Museum, Sydney, New South Wales; AMNH – American Museum of Natural History, New York, USA; ANIC – Australian National Insect Collection, CSIRO, Canberra, ACT; BMNH – Natural History Museum, London, UK; LACM – Los Angeles County Museum, California, USA; NMV – Museums Victoria, Melbourne, Victoria; QDPI – Queensland Department of Primary Industries, Brisbane, Queensland; QM – Queensland Museum, Brisbane, Queensland; SEM – Snow Entomological Museum, Kansas University Biodiversity Institute, University of Kansas, Kansas, USA.

Taxonomy

Key to both sexes of all known *Lasioglossum* (*Callalictus*) species

- | | | |
|-------------|--|----------------------------------|
| 1(a) | 12 antennal segments (females) | 2 |
| 1(b) | 13 antennal segments (males) | 4 |
| 2(a) | Mesoscutum coloured red-brown, legs dark brown (Fig. 4A) | <i>L. callomellitinum</i> |
| 2(b) | Mesoscutum coloured black or ochre, legs ochre (Figs 3A, 5A) | 3 |
| 3(a) | Mesoscutum and at least basal half of antennal scapes coloured ochre (Figs 3A–B) | <i>L. aurantiacum</i> |
| 3(b) | Mesoscutum and antennal scapes coloured black (Figs 5A–B) | <i>L. musgravei</i> |
| 4(a) | Fore tarsal segments highly modified as follows: horizontally compressed, flattened, apically bilobed and weakly convex dorsally (forebasitarsus ratio of width versus length 0.6), with elongated lateral hair tufts from each segment (Figs 3D–E, 5D–E); ventral surface of fore and mid tarsal segments dark coloured with central pale white line running down each segment; S3 hairs not extending across sternite, S4 hairs either not reaching lateral margins or lateral hair length equal to mesial hair length and adpressed not erect (Figs 3F, 5F) | 5 |
| 4(b) | Fore tarsal segments not modified as follows: narrow, rounded, not compressed or apically bilobed (forebasitarsus ratio of width versus length 0.2), without elongate lateral hair tufts (Figs 4D–E), ventral surface of fore and mid tarsal segments without central pale white line; | |

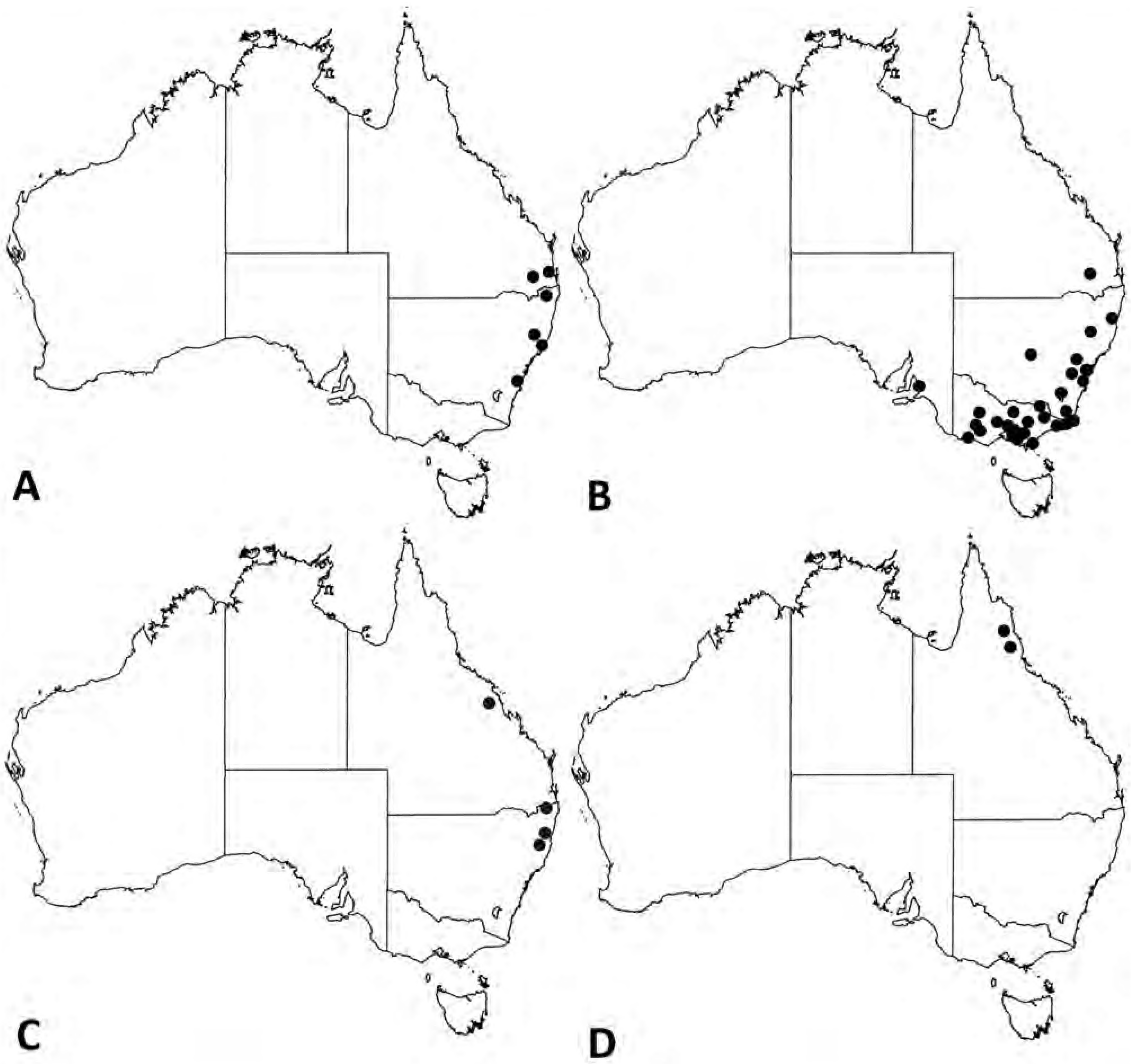


Figure 1. Species distribution maps: A, *Lasioglossum (Callalictus) aurantiacum*; B, *Lasioglossum (Callalictus) callomellittinum*; C, *Lasioglossum (Callalictus) musgravei*; D, *Lasioglossum (Austrevylaeus) contaminatum*.

S3 with apical, dense cover of white hairs across sternite, S4 lateral hairs elongated and longer than mesial hairs and lateral hairs erect (Fig. 4F)

L. callomellittinum

5(a) Mesoscutum coloured ochre (Fig. 3C); S3 mesial sternal hairs not reaching hairs on S4 (Fig. 3F)

L. aurantiacum

5(b) Mesoscutum coloured black (Fig. 5C); S3 mesial sternal hairs reaching hairs on S4 (Fig. 5F)

L. musgravei

Family HALICTIDAE

Subfamily HALICTINAE

***Lasioglossum* subgen. *Callalictus* Michener**

Subgeneric diagnosis: Body length moderately large (6.75 mm to 9.11 mm), non-metallic, with mesoscutum variously reddish, ochre or dark coloured and metasoma black, reddish brown or ochre coloured (Figs 3A–B, 4A–B, 5A–B); Female: labrum tapered and pointed, margins unmodified; pronotum with prominent dorsolateral angles (Figs 3A, 4A, 5A), mesoscutum surface with a dull sheen, with minute punctures at various puncture densities, propodeum not defined by strong carinae (weak posterolateral or posterior carinae at most), dorsal surface sculpture smooth or with microtessellate pattern; female inner hind tibial spur pectinate, hind basitibial

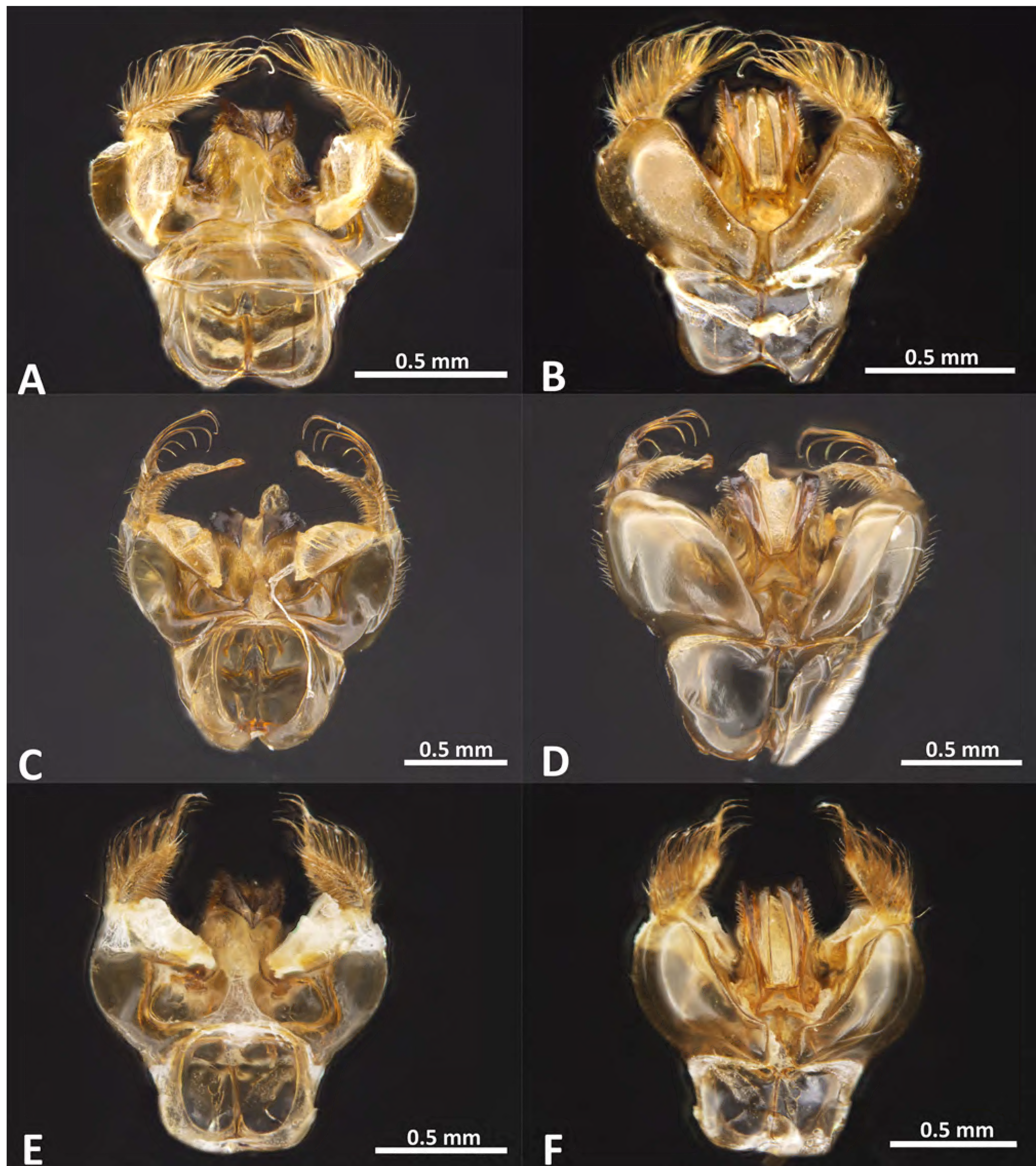


Figure 2. Male genitalia capsules: Left – ventral views, Right – dorsal views: A–B, *Lasioglossum (Callalictus) aurantiacum*; C–D, *Lasioglossum (Callalictus) callomelittinum*; E–F, *Lasioglossum (Callalictus) musgravei*.

plate pointed, absent on male; both sexes without tergal tomentous bands on metasoma. Male: similar to female in body colour and sculpture (Figs 3C–D, 4C–D, 5C–D); genitalia with elongated, setose gonostyli (Figs 2A–F) (one species with bifid gonostyli: Figs 2C–D), retrorse lobes enlarged, thin and membranous (Figs 2A, 2C, 2E); S4–S5 with weak hair to dense tomentous bands across sternites (Figs 3F, 4F, 5F). Males of *L. aurantiacum* (Cockerell 1916) and *L. musgravei* (Cockerell 1929b) with fore tarsal segments horizontally compressed, flattened, api-

cally bilobed and weakly convex dorsally (forebasitarsus ratio of width versus length 0.6), with elongate lateral hair tufts from each tarsal segment (Figs 3D–E, 5D–E, 6), ventral surface of fore and mid tarsal segments dark coloured and with pale white line running down the middle of each segment, mid tarsal segments of these two species similar to fore tarsi but to a lesser degree but width versus length ratio same; male of *L. callomelittinum* (Cockerell 1910) with fore and mid tarsal segment

not modified (forebasitarsus ratio of width versus length 0.2) (Figs 4D–E), ventral inner surface entirely white.

Remarks. Similar to *Lasioglossum* subgenera *Australictus* and *Parasphecodes* but differs by large dorsolateral angles of pronotum, smooth integument of mesosoma and propodeum and pectinate nature of inner hind tibial spur (inner hind tibial spur: *Australictus* finely serrate to simple; *Parasphecodes* coarsely serrate). Michener's (1965: 170) diagnosis for the subgenus *Callalictus* included the character "third submarginal cell usually receiving both recurrent veins; this condition is rare in other Australian halictids". Michener (2007) did not repeat this character in the subgeneric diagnosis for the subgenus *Callalictus*. Examination of the three valid species of the subgenus *Callalictus* showed only *Lasioglossum* (*Callalictus*) *callomelittinum* has the third submarginal cell receiving both recurrent veins and so this character is not used in the subgeneric diagnosis. The male fore tarsal modification in two species of the subgenus *Callalictus* is not a common character of Halictini males. Walker (1997) recorded males of four species of Australian *Homalictus* (*H. atrus* Walker 1997, *H. grossopedalis* Walker 1986, *H. latitarsis* (Friese 1909) and *H. maitlandi* (Cockerell 1910)) with horizontally compressed and flattened fore and mid tarsal segments and each broadened tarsal segment has lateral hair tufts. The distinct ventral, central white stripe against a dark background colouration, lateral hair tufts, the horizontally compressed, flattened, bilobed and broadened and concave shape associated with the modified fore and mid tarsal segments found in males of two *Callalictus* species suggests they may be used in mating and the shape of the tarsal segments suggests they may be placed over the eyes of the female.

Lasioglossum (*Callalictus*) *aurantiacum* (Cockerell)

(Figs 1A, 2A–B, 3A–F)

Parasphecodes aurantiacus Cockerell 1916: 200.

Parasphecodes tooloomensis Cockerell 1929a: 317. **syn. nov.**

Lasioglossum (*Callalictus*) *aurantiacum* - Michener 1965: 170.

Lasioglossum (*Callalictus*) *tooloomense* - Michener 1965: 170.

Material examined. Holotype of *aurantiacus* ♀, Queensland, Brisbane, H. Hacker, 28 May 1914 (QM). The type card has two sets of numbers: "Hy/5043" and "4143" which are written at either end of the card. The type is missing both antennae but seven flagella segments from one antenna are glued to the location label.

Holotype of *tooloomensis* ♀, New South Wales, Tooloom NSW Jan 1926 H. Hacker - Hy/3748 (QM). There are 16 specimens pinned or glued to five different pieces of

pinned pith all with the same printed label "Tooloom, NSW Jan 1926 H. Hacker" all in the QM (four specimen micropinned on one pith, four specimens micropinned on one pith, two specimens micropinned on one pith, and two specimens glued to two cards on single pin (top specimen with metasoma glued to card point). All five sets of pinned specimens have the same registration number "Hy/3748". One pin with four specimens has a Holotype label while the other four pins have Paratypes labels. The Holotype label pin has four specimens and has in Cockerell's handwritten a label which reads "Parasphecodes tooloomensis Ckll Type at end of row". There is one male specimen with no location label, but a label attached by C.D. Michener which says "Paratype". There is a gap in one of the Paratype labelled pins which contains five specimens. It seems Michener selected the only male specimen in the series of 17 specimens and removed the genitalia to examine. The genitalia are attached to the pin in a small glass vial. This specimen is now located in SEM. There is an additional single directly pinned specimen also with a Paratype label and registration number Hy/3748 with head glued to location label. However, the locality label for this specimen reads "National Pk., Q, H. Hacker Dec 1921". This specimen location was not in the original description, therefore has no type status.

Diagnosis

Lasioglossum (*Callalictus*) *aurantiacum* is distinguished in both sexes from other *Callalictus* species by the primarily ochre coloured body and leg colour except for a black head and T4–T5 dark brown to black (Figs 3A–D). The body of *Lasioglossum aurantiacum* is relatively smooth with microtessellate sculpture and minute punctures on the mesoscutum. The dorsal surface of the propodeum is smooth with weak lateral carinae only. The male is characterised by modified tarsi as follows: the fore tarsal segments is horizontally compressed, flattened, apically bilobed and weakly convex dorsally (forebasitarsus ratio of width versus length as 0.6), with elongate lateral hair tufts from each tarsal segment (Figs 3D–E), ventral surface of fore and mid tarsal segments dark coloured but with pale white line running down the middle of each segment, mid tarsal segments similar to fore tarsi but to a lesser degree. The male sternal vestiture is weak across S3–S5 (Fig. 3F). The male genitalia of *L. aurantiacum* (Figs 2A–B) are similar to that found in *L. musgravei* (Figs 2E–F) but can be separated by the different lengths of setae on the gonostyli on *L. musgravei* compared to all setae being the same length on *L. aurantiacum*.

Description of female (Figs 3A–B) Body length: 7.54–8.12–8.64 mm (n=6); forewing length: 1.97–2.05–2.11 mm (n=6); head width: 2.45–2.70–2.83 mm (n=6); intertegular distance: 1.27–1.38–1.46 mm (n=6). Relative head measurements: HW: 100, HL: 87–89, UID: 49–51, LID: 50–52, IAD: 7–8, OAD: 25–26, IOD: 16–17, OOD: 10–11, CL: 24–25, GW: 20–21, EW: 32–33,



Figure 3. *Lasioglossum (Callalictus) aurantiacum* A–F: A, dorsal female; B, lateral female; C, dorsal male; D, lateral male; E, male fore and mid tarsal segments; F, male sternal vestiture.

SL: 48–50, FL: 85–88. *Head*. Inner eyes parallel to diverging below; median frontal carina reaching half way to median ocellus; clypeus polished on anterior half and dull on posterior half covered with microtessellate sculpture, anterior half with several large, irregular shaped punctures, posteriorly openly to closely punctate with small, rounded punctures, supraclypeal area dull, covered with microtessellate sculpture, sparsely punctate across surface with small, rounded punctures; frons sculpture above antennal bases densely punctate,

punctate sculpture extends across entire surface except smooth along eye margins. *Mesosoma*. Pronotum dorsolateral angles prominent and pointed in dorsal and lateral views; mesoscutum anterior mesial margin produced mesoanteriorly, surface dull, mesially openly punctate, entire surface covered with a fine, microtessellate sculpture, parapsidal areas closely punctate with small punctures, either side of parapsidal lines densely punctate with distinct interspaces, densely punctate along posterior margin; scutellum length greater than

dorsal surface of propodeum, (1.5 x), scutellum strongly bi-bulbous with raised mounds on either side of midline, closely punctate along anterior margin, remainder openly punctate, surface dull; propodeum weakly carinate along posterior margin only, carinae below dorsal level and on either side of midline but carinae do not meet mesially, posterolateral carinae forming an angle of approximately 45 degrees with dorsal surface, no dorsal rim, horizontal dorsal surface of propodeum V-shaped, laterally remainder of dorsal surface curve steeply on to vertical surface giving a "saddle-like" appearance, lateral margins smooth, dorsal surface microtessellate with several weak striae mesially, sculpture reaches to posterior rim, lateral margins microtessellate only; mesepisternum striolate, metepisternum smooth and openly punctate; first recurrent vein entering second marginal cell. *Metasoma and legs.* Metasomal T1–T5 dull, smooth and impunctate; inner hind tibial spur pectinate, teeth distinctly separate.

Colour. (Figs 3A–B) Body primarily ochre coloured; head black except antennal scape light brown and flagella brown, clypeus dark brown, mandibles ochre coloured, apically red-brown, legs dark brown, some dark brown to black areas suffused on mesoscutum, dorsal propodeum, lateral margins of T1 and T4–T6 dark brown to black.

Vestiture. Body vestiture sparse, some adpressed hair around margins of supraclypeal area and in paraocular areas, dense white hair around pronotum lateral spiracle cover, dense cover of minute, adpressed white hair on lateral margins of propodeum.

Description of male: (Figs 3C–D) Body length: 7.85 mm (n=1); forewing length: 2.02 mm (n=1); head width: 2.06 mm (n=1); intertegular distance: 1.32 mm (n=1). Relative head measurements: HW: 100, HL: 92, UID: 51, LID: 39, IAD: 11, OAD: 28, IOD: 20, OOD: 10, CL: 26, GW: 20, EW: 36, SL: 26, AS4/AS2+3 (15/15) 1.0, FL: 195. *Differs from female as.* Inner eyes converging below; median frontal carina reaching just above upper antennal insertion points; frons sculpture reticulate across surface to inner margins of eyes; scape reaches below level of median ocellus; clypeus surface dull, divided into two sections, section below the supraclypeal area about one third length of clypeus continues contours, section two about two thirds length of clypeus almost at right angle to section one; mesoscutum surface dull, covered with microtessellate pattern, openly to closely punctate, densely punctate in parasidal areas, punctures minute; scutellum dull, distinctly bi-bulbous, openly to closely punctate with small, shallow punctures, dorsal surface of propodeum acarinate; legs with fore tarsal segments being horizontally compressed, flattened, flanged, apically bilobed and weakly convex dorsally, mid tarsal segment with similar shape but to lesser extent to fore tarsal segments (forebasitarsus and midbasitarsus width versus length ratio as 0.6), tarsal segments with lateral hair tufts (Figs 3D–E), ventral surface of fore and

mid tarsal segments glabrous, fore femora swollen mesially; colour similar to female, except metasoma ochre coloured with some brown markings throughout metasoma. *Vestiture.* Head with dense cover of adpressed hair in paraocular areas and lower frons forming a dense matt, mesosoma with sparse cover of erect, mesoventral area with moderate cover of branched setae over surface, metasomal sternal vestiture sparse except S3 with some elongate, backwardly directed hairs mesially only, S4 with moderate cover of backwardly directed hair across sternite, S5 with short, adpressed hair around midline, S6 with inwardly directed adpressed hair (Fig. 3F).

Genitalia and associated sterna. (Figs 2A–B) Gonobase sides parallel to slightly narrowed basally, complete ventroapically, gonobase width almost half of gonocoxite width, gonocoxite glabrous, dorsal inner margins of gonocoxite basally broadly truncate; apical inner margin not produced and continues contours of gonostylus, glabrous; retrorse lobes large, almost meeting at midline, membranous and parallel; outer margins of retrorse lobes with moderate cover of short setae, inner margins of retrorse lobes glabrous; gonostyli erect, distally large and rounded distally, with dense cover of long, simple, erect hair, length of hairs at least one third width of gonobase, all hairs of about equal length, ends of hairs curved inwardly towards midline; penis valves strongly curved apically, with short dense cover of hair dorsolaterally.

Other specimens examined (6♀, 1♂)

QUEENSLAND: (1♀) Mt. Molar 12 Sept 1998 (NMV); (1♀) Brisbane, 29 Sep 1914, H. Hacker (QM); (1♀) Mt. Glorious, 28 March – 2 April 1987, Yves Bassett, on *Argyrodendron actinophyllum* (NMV)

NEW SOUTH WALES & AUSTRALIAN CAPITAL TERRITORY: (1♀) Elizabeth Bay, 23 Jan 1952 (AM); (1♀) Lorien Wildlife Refuge, 3km N Lansdowne, 4 Oct 2001, G. Williams, ex *Dianella caerulea* flowers, ex wet sclerophyll forest (NMV); (1♀) Lorien Wildlife Refuge, 3km N Lansdowne, 4 Oct 2001, G. Williams, on *Pollia crispata* flowers, ex wet sclerophyll forest (NMV); (1♂) Mt. Keira, 23 Feb 1983, G.A. Holloway (AM)

Floral Record. Families Visited: 3 (Asphodelaceae (1), Commelinaceae (1) Malvaceae (1)). Genera Visited: 3 (*Argyrodendron* (1), *Dianella* (3), *Pollia* (1))

Flight Phenology capture records. Jan (1) Feb (1) Mar (1) Apr (0) May (0) June (0) July (0) Aug (0) Sept (2) Oct (2) Nov (0) Dec (0)

Distribution. Collected from several locations between SE Queensland and Sydney following coast and slightly inland (Fig. 1A).

Remarks. The ochre coloured body of this species suggests it may be a low-light foraging species but there are no records or evidence to support it forages in low light

at matinal, crepuscular or nocturnal times and the ocelli are not enlarged.

Lasioglossum (Callalictus) callomelittinum (Cockerell)

(Figs 1B, 2C–D, 4A–F)

Parasphecodes callomelittinus Cockerell 1910: 237.

Halictus ruficollis Friese 1924: 237. **syn. nov.**

Parasphecodes rufocollaris Cockerell 1930: 37. **syn. nov.**

Callomelitta anomala Rayment 1935: 654. **syn. nov.**

Lasioglossum (Callalictus) callomelittinum - Michener 1965: 170.

Lasioglossum (Callalictus) ruficolle - Michener 1965: 170.

Lasioglossum (Callalictus) rufocollare - Michener 1965: 170.

Lasioglossum (Callalictus) anomalum - Michener 1965: 170.

Material examined. Holotype of *callomelittinus* ♀ Victoria, Melbourne, C7 S. c-c Turner Coll. 1910-7 Hym.17.a.624. (BMNH)

Typus of *ruficollis* ♂ South Australia: Adelaide, 21.9.06 Frank (Am. Mus. Nat. Hist. Dept. Invert. Zool. No. 26932) (AMNH)

Holotype of *rufocollaris* ♀ Queensland, [Lamington] National Park, Dec 1921, H. Hacker, Hy/4096 (QM)

Holotype of *anomala* ♀ New South Wales, Bilpin, Kurrajong Heights (ANIC)

Diagnosis

Lasioglossum (Callalictus) callomelittinum is distinguished in both sexes from other *Callalictus* species by body and leg colours which in both sexes is primarily a dark brown to black colour except with the mesoscutum, scutellum and metanotum a bright orange red-brown colour (Figs 4A–D). The body of *Lasioglossum callomelittinum* is relatively smooth with microtessellate sculpture and minute punctures on the mesoscutum. The dorsal surface of the propodeum is smooth with distinct posterolateral carinae only. The male does not have modified tarsal segments (forebasitarsus width versus length ratio as 0.2) (Figs 4D–E) but has remarkable and large, curved sternal vestiture on segments S3–S4 (Fig. 4F) and the male genitalia bifid gonostyli (Figs 2C–D) are unique for *Callalictus*.

Description of female (Figs 4A–B) Body length: 8.01–8.64–8.67 mm (n=10); forewing length: 2.30–2.55–2.69 mm (n=10); head width: 2.26–2.29–2.31 mm (n=10); intertegular distance: 1.82–1.90–1.97mm (n=10). Relative head measurements: HW: 100, HL: 90–92, UID: 56–57, LID: 48–49, IAD: 5–6, OAD: 25–26, IOD: 12–13, OOD: 14–15, CL: 23–24, GW: 13–15, EW:

26–27, SL: 48–50, FL: 95–98. *Head.* Inner eyes diverging below; median frontal carina reaching half way to median ocellus; clypeus polished on anterior one third, remainder dull on posterior half covered with microtessellate sculpture, anterior half with several large, irregular shaped punctures, posteriorly openly to closely punctate with small, rounded punctures, supraclypeal area dull, covered with microtessellate sculpture, open to closely punctate across surface with small rounded punctures; frons sculpture above antennal bases densely punctate, punctate sculpture extends two-thirds to inner eye margins where sculpture sparsely punctate and smooth along eye margins. *Mesosoma.* Pronotum dorsolateral angles prominent and pointed in dorsal and lateral views; mesoscutum anterior mesial margin produced mesoanteriorly, surface shining, mesially openly punctate, entire surface covered with a fine, microtessellate sculpture, parapsidal areas closely to densely punctate with small punctures, either side of parapsidal lines closely punctate with distinct interspaces, closely to densely punctate along posterior margin; scutellum length greater than dorsal surface of propodeum, (1.15 x), scutellum weakly bi-bulbous with slightly raised mounds on either side of midline, closely punctate along anterior margin, remainder openly punctate, surface shining; propodeum distinctly carinate in posterolateral corners only, carinae below dorsal level and at angle on either side of midline but carinae do not meet mesially, posterior margin lateral carinae extend laterally to give dorsal surface a square appearance in dorsal view, with slightly raised, curved margin defining posterior margin, laterally remainder of dorsal surface curve steeply on to vertical surface, lateral margin smooth, dorsal surface microtessellate with several weak striae mesially, sculpture reaches to posterior rim, lateral margins microtessellate only; mesepisternum striolate, metepisternum smooth and openly punctate, first recurrent vein entering third marginal cell. *Metasoma and legs.* Metasomal T1–T2 shining and openly punctate, T3–T5 shining appearing impunctate except pits at base of each hair; inner hind tibial spur pectinate, teeth distinctly separate, apically rounded.

Colour. (Figs 4A–B) Head, pronotum, metanotum, propodeum and metasoma black except in some specimens pronotum lateral corners, metanotum mesially, dorsolateral margins of propodeum light red-brown and T1–T2 either dark brown or with patches of light red-brown, mesoscutum and scutellum light red-brown, legs brown except in some specimens of anterior of fore and mid femora and tibiae light red-brown.

Vestiture. Body vestiture sparse, some long, downwardly directed hair in supraclypeal areas, dense white hair around pronotum lateral spiracle cover, dense cover of minute, adpressed white hair on lateral margins of propodeum.

Description of male: (Figs 4C–D) Body length: 7.54–8.25–8.32 mm (n=10); forewing length:

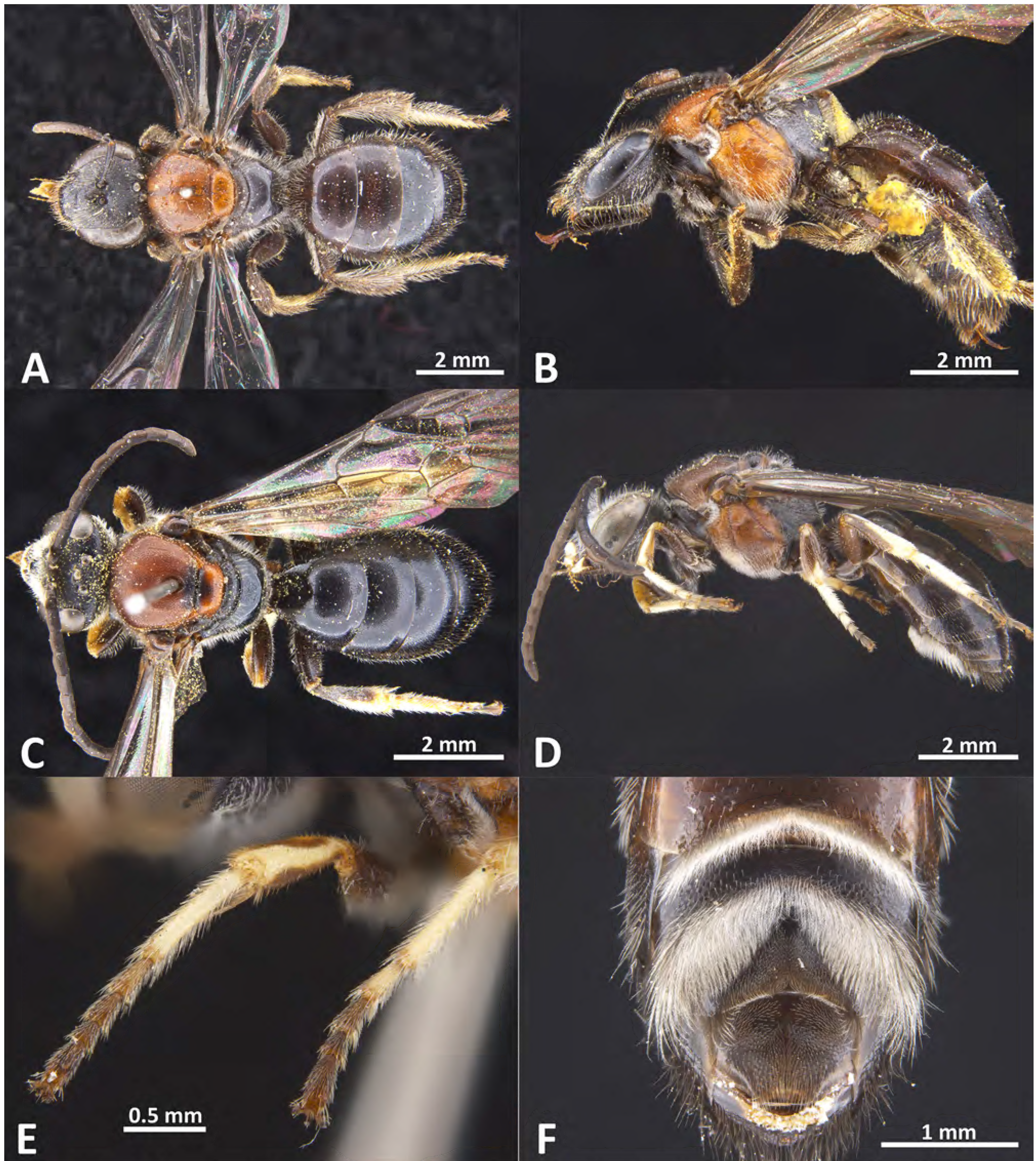


Figure 4. *Lasioglossum (Callalictus) callomelittinum* A-F: A, dorsal female; B, lateral female; C, dorsal male; D, lateral male; E, male fore and mid tarsal segments; F, male sternal vestiture.

2.49–2.56–2.64 mm (n=10); head width: 2.11–2.19–2.21 mm (n=10); intertegular distance: 1.85–1.86–1.87 mm (n=10). Relative head measurements: HW: 100, HL: 88–90, UID: 50–52, LID: 40–41, IAD: 11–12, OAD: 25–26, IOD: 16–17, OOD: 11–12, CL: 22–23, GW: 18–19, EW: 33–34, SL: 23–23, AS4/AS2+3 (17/15) 1.1, FL: 170–172. *Differs from female as.* Inner eyes converging below; median frontal carina reaching just above upper antennal insertion points; frons sculpture reticulate across surface to inner margins of eyes; scape reaches well

below level of median ocellus; clypeus surface shining basally, with a dull sheen apically, closely punctate with large, irregular shaped punctures, supraclypeal area dull and densely punctate; mesoscutum surface dull, covered with microtessellate pattern, mesially open to closely punctate, closely punctate towards parasidal areas, densely punctate parasidal areas; scutellum dull, distinctly bi-bulbous but not with large mounds on either side of midline, openly to closely punctate with small, shallow punctures; dorsal surface of propodeum

acarinate, mesially with microtessellate sculpture, laterally almost smooth; legs with fore and mid tarsal segments (Fig. 4D–E) narrow and rounded, not horizontally compressed or flattened (forebasitarsus and midbasitarsus width versus length ratio as 0.3) and without lateral hair tufts, ventral surface of fore and mid tarsal segments with erect setae; colour similar to female, head black, pronotum, metanotum, propodeum and metasoma black, mesosoma, mesepisternum and metepisternum orange red-brown colour except small patch of black along mesoscutum posterior margin and anterior margin of scutellum, legs bark brown except apical ends of tibiae and tarsal segments white-cream coloured. *Vestiture*. Head with dense cover of adpressed hair in paraocular areas and up frons to medium ocellus, forming a dense matt, mesepisternum with a dense matt of white adpressed hair ventrally, propodeum laterally, mesosoma and scutellum glabrous, metasomal sternal vestiture sparse except apical margin of S3 with dense row of erect, white plumose hair apically across sternite, S4 with thick cover of white backwardly directed, adpressed hair in V-shaped across sternite, thinnest mesially and widening laterally, hairs on lateral margins of S3–S4 erect and elongated, more so on S4, S5 with sparse cover of backwardly directed adpressed hair, S6 basal half with short, adpressed hairs laterally directly, apical half with short, adpressed hair backwardly directly, some longer, backwardly directed hairs along apical margin (Fig. 4F).

Genitalia and associated sterna. (Figs 2C–D) Gonobase sides slightly narrowed basally, complete ventroapically, gonobase width more than half width of gonocoxite; gonocoxite with dense row of hairs on apical half of lateral margins, dorsal inner margins of gonocoxite basally rounded; apical inner margin not produced and continues contours of gonostylus; retrorse lobes large, apically rounded, parallel but not meeting at midline, lobes glabrous; gonostylus thickened basally as a single arm, with a dense cover of setae, distally distinctly bifid, gonostylus plus erect hairs length equals length of gonocoxite, inner arm more than twice as long as outer arm, inner arm glabrous and lobed distally, outer arm less than half length of inner arm, outer arm with three sets of elongate, bifid setae inwardly directed except ends of setae strongly curved basally; penis valves strongly curved apically, with short dense cover of hair dorsolaterally.

Other specimens examined (62♀; 48♂)

QUEENSLAND: (1♂) Millmerran, 22 May 1966, H. Burton (QM)

NEW SOUTH WALES & AUSTRALIAN CAPITAL TERRITORY: (9♀; 31♂) Mt. Tomah, Blue Mtns, 13 March 1977 – 5 Feb 1991, N.W. Rodd (AM); (1♀; 2♂) 6 km NE Bilpin, Blue Mtns, 20 April 1982 – 28 Feb 1986, N.W. Rodd (AM); (2♀) Haystack Ridge, nr, Mt. Tomah, 19 Oct 1977, N.W. Rodd (AM); (1♀) Dorriggo Nat. Pk, 17 Nov 1990, N.W. Rodd

(AM); (1♀) Kurrajong, 26 Oct 1966, McApline and Holloway (AM); (5♀) Lorien Wildlife Refuge, 3 km N Lansdowne, 21 Sept – 4 Oct 2001, G. Williams (NMV); (1♀) 3 km N Lansdowne, 19 Sept 1991, G. Williams, on *Acradenia euodiiformis* blossoms (NMV); (1♀) Brindabella Ra, Cori Dam area, 29 Dec 1988, R.R. Snelling (LACM); (1♀) Canberra, 31 Oct 1988, R.R. Snelling (LACM); (1♀) Lees Spring, Brindabella. 24 Oct 1931, L.F. Graham (SEM); (1♀) Blue Gum Knob, Up Chichester, Sept 1921, A. Musgrave (AM); (3♀) Mt. Victoria, 20 Oct 1930, A.N. Burns (NMV); (1♀) Clyde Mtns, 27 Oct 1968, J.C. Cardale, on *Pultenaea altissima* (ANIC); (1♀) Nadgee Reserve, Merrika Lodge, 18 Feb 1987, E.A. Sugden, on *Eucalyptus obliqua* (AM); (1♀) Winburndale Nat. Pk, 12 km E Bathurst, 6 Dec 1974, J. Cardale (ANIC); (1♀) Mt. Dromedary nr, Narooma, 4 Feb 1969, M.S. Upton & J.C. Cardale (ANIC); (1♂) New England Nat. Pk, via Ebor, 8–9 April 1966, T. Weir (QM); (5♀) NE Nat. Pk, near Wright's Lookout, 14 Oct 1961, C.W. Frazier (ANIC); (1♀) Sealy Lookout nr Coffs Harbour, 6 Sept 1983, G. Daniels & M.A. Schneider (QM)

VICTORIA: (1♀) Erica, 19 April 1983, P. Bernhardt, *Acacia terminalis* (NMV); (1♀) Victoria Valley, 26 Feb 1949, B.G. (NMV); (2♀) N of Lakes Entrance, Colquhoun State Forest, 21 Feb 1985, K. Walker, on *Eucalyptus* (NMV); (1♀) McKenzies Falls, Grampians, 30 Sept 1954, A.N. (NMV); (1♀) 11 km WNW Halls Gap, 37.07S 142.24E, 21 Oct 1983, I.D. Naumann & J.C. Cardale (ANIC); (1♀) Grampians, 1 Nov 1928, C. Barrett (SAM); (1♀) Halls Gap, 1 Nov 1928, C. Barrett (SAM); (2♀) Belgrave, 11 Nov 1928, A.S. (SAM); (3♀) Kallista, 13 Mar 1949 & 2 Dec 1959, A.B. (NMV); (1♀) Ferntree Gully, 21 Nov 1931, A.N. Burns (NMV); (2♀) 12 km SE Merrijig, Howqua River, 30 Nov 1971, A. Neboiss (NMV); (1♂) Millgrove, 27 March 1954, A. Neboiss (NMV); (1♀) Junction of Snowy and Buchan Rivers, 25 Oct 1981, D.J. Stewart (NMV); (1♀) 22 km N Dunkeld, 6 Nov 1988, R. Snelling & J. Gray (LACM); (13♂) Caboboonee State Forest, 1.3 km E Wrights Swarm Road, 3 March 1990, W.T. Wcislo ex Brenesia sp. (SEM); (2♂) Caboboonee State Forest, 2 March 1990, W.T. Wcislo, ex. *Eucalyptus* (SEM); (1♀) Caboboonee State Forest, 1 Jan 1990. W.T. Wcislo (SEM); (1♀) 22 km N Portland, 22 Dec 1989, W.T. Wcislo ex. pan trap (SEM); (3♀) Royal National Park, 34.08S 151 04E, 21 Nov 1990, P. Bernhardt, ex. *Hibbertia scandens* (SAM); (1♀) Mt. Tomah, 33.33S 150.25E, 2 Nov 1990, P. Bernhardt. ex *Hibbertia saligna* (NMV)

South Australia: (1♀) Bridgewater, 1 Nov 1946, F.A. (NMV)

Floral Record. Families Visited: 4 (Fabaceae (2), Dilleniaceae (2), Myrtaceae (1), Rutaceae (1)). Genera Visited: 5 (*Acacia* (1), *Acradenia* (1), *Eucalyptus* (1), *Hibbertia* (2), *Pultenaea* (1))

Flight Phenology capture records. Jan (1) Feb (7) Mar (5) Apr (3) May (1) June (0) July (0) Aug (0) Sept (5) Oct (10) Nov (8) Dec (4)

Distribution. A single record found in SE Queensland, then occurs down through New South Wales and Victoria and a single record in SE South Australia (Fig. 1B).

Remarks. The metasomal colour of the male Friese TYPUS specimen of *Halictus ruficollis* is light red-brown compared to the darker brown metasomal colour found on all other examined specimens. This may have been a freshly emerged specimen when collected. However, the head, mesosomal and legs colours of the Friese TYPUS match all other examined specimens. The striking metasomal sternal vestiture on the TYPUS is also a match for typical specimens. This species is the most common and widely distributed species in the subgenus *Callalictus* – Queensland to South Australia. The amazing male sternal metasomal tomentum is large, white and diagnostic.

Lasioglossum (Callalictus) musgravei (Cockerell)

(Figs 1C, 2E–F, 5A–F, 6)

Parasphecodes tooloomensis musgravei Cockerell 1929b: 230.

Lasioglossum (Callalictus) musgravei - Michener 1965: 170.

Material examined. Holotype of *musgravei* ♀, Queensland, [Lamington] National Park, Macpherson Range, 22 December 1926 - K57736 (AM).

Diagnosis

Lasioglossum (Callalictus) musgravei is distinguished in both sexes from other *Callalictus* species by the primarily dark brown to black body colours except the scutellum, metanotum and legs which are ochre coloured (the male colouration has red-brown suffused in T2–T5) (Figs 5A–D). The body of *Lasioglossum musgravei* is relatively smooth with microtessellate sculpture and minute punctures on the mesoscutum. The dorsal surface of the propodeum is smooth and weakly carinate along the posterior margin. The male is characterised by modified tarsi as follows: the fore tarsal segments is horizontally compressed, flattened, apically bilobed and weakly convex dorsally (forebasitarsus ratio of width versus length as 0.6), with elongate lateral hair tufts from each tarsal segment (Figs 5D–E, 6), ventral surface of fore and mid tarsal segments dark coloured but with pale white line running down the middle of each segment, mid tarsal segments similar to fore tarsi but to a lesser degree. The male sternal vestiture is strong across S3–S5 (Fig. 5F) but not as developed and striking as found in *Lasioglossum callomelittinum* (Fig. 4F). The male genitalia of *L. musgravei* (Figs 2E–F) are similar to that found in *L. aurantiacum* (Figs 2A–B) but can be separated by the different lengths of setae on the gonostyli compared to all setae being the same length on *L. aurantiacum*.

Description of female (Figs 5A–B) Body length: 6.75–7.25–7.54 mm (n=6); forewing length: 2.21–2.26–2.30 mm (n=6); head width: 2.21–2.23–2.26 mm (n=6); intertegular distance: 1.73–1.77–1.82mm (n=6). Relative head measurements: HW: 100, HL: 90–92, UID: 50–51, LID: 51–52, IAD: 6–7, OAD: 27–28, IOD: 13–14, OOD: 10–12, CL: 22–23, GW: 18–19, EW: 28–29, SL: 40–42, FL: 82–85. *Head.* Inner eyes parallel to diverging below; median frontal carina reaching half way to median ocellus; clypeus polished on anterior one third, remainder dull on posterior half covered with microtessellate sculpture, anterior half with several large, irregular shaped punctures, posteriorly openly to closely punctate with small, rounded punctures, supraclypeal area dull, covered with microtessellate sculpture, sparsely punctate across surface with small rounded punctures; frons sculpture above antennal bases densely punctate, densely punctate sculpture extends to only width of antennal bases, either side openly to sparsely punctate and smooth along eye margins. *Mesosoma.* Pronotum dorsolateral angles prominent in dorsal and lateral views; mesoscutum anterior mesial margin produced mesoanteriorly, surface dull, mesially openly to sparsely punctate, entire surface covered with a fine, microtessellate sculpture, parapsidal areas closely punctate with small punctures, either side of parapsidal lines densely punctate with distinct interspaces, closely to densely punctate along posterior margin; scutellum length greater than dorsal surface of propodeum, (1.25 x), scutellum strongly bi-bulbous with raised mounds on either side of midline, closely punctate along midline, remainder openly punctate, surface dull; propodeum weakly carinate along posterior margin only, carinae below dorsal level and on either side of midline but carinae do not meet mesially, no distinct dorsal rim, horizontal dorsal surface of propodeum V-shaped, laterally remainder of dorsal surface curve steeply on to vertical surface giving a "saddle-like" appearance, lateral margin smooth, dorsal surface microtessellate with several weak striae mesially, sculpture reaches to posterior rim, lateral margins microtessellate only; mesepisternum striolate, metepisternum smooth and openly punctate; first recurrent vein entering second marginal cell. *Metasoma and legs.* Metasomal T1–T5 dull, smooth, T1–T2 openly punctate with minute punctures, T3–T5 impunctate; inner hind tibial spur pectinate, teeth distinctly separate.

Colour. (Figs 5A–B) Head and mesoscutum black except antennal scape, flagella and clypeus dark brown, mandibles ochre coloured, apically red-brown, pronotum, scutellum, metanotum and legs ochre to light brown coloured, metasoma black or light red brown, areas suffused with black, T5 generally dark brown to black.

Vestiture. Body vestiture sparse, some adpressed hair in supraclypeal areas, dense white hair around pronotum

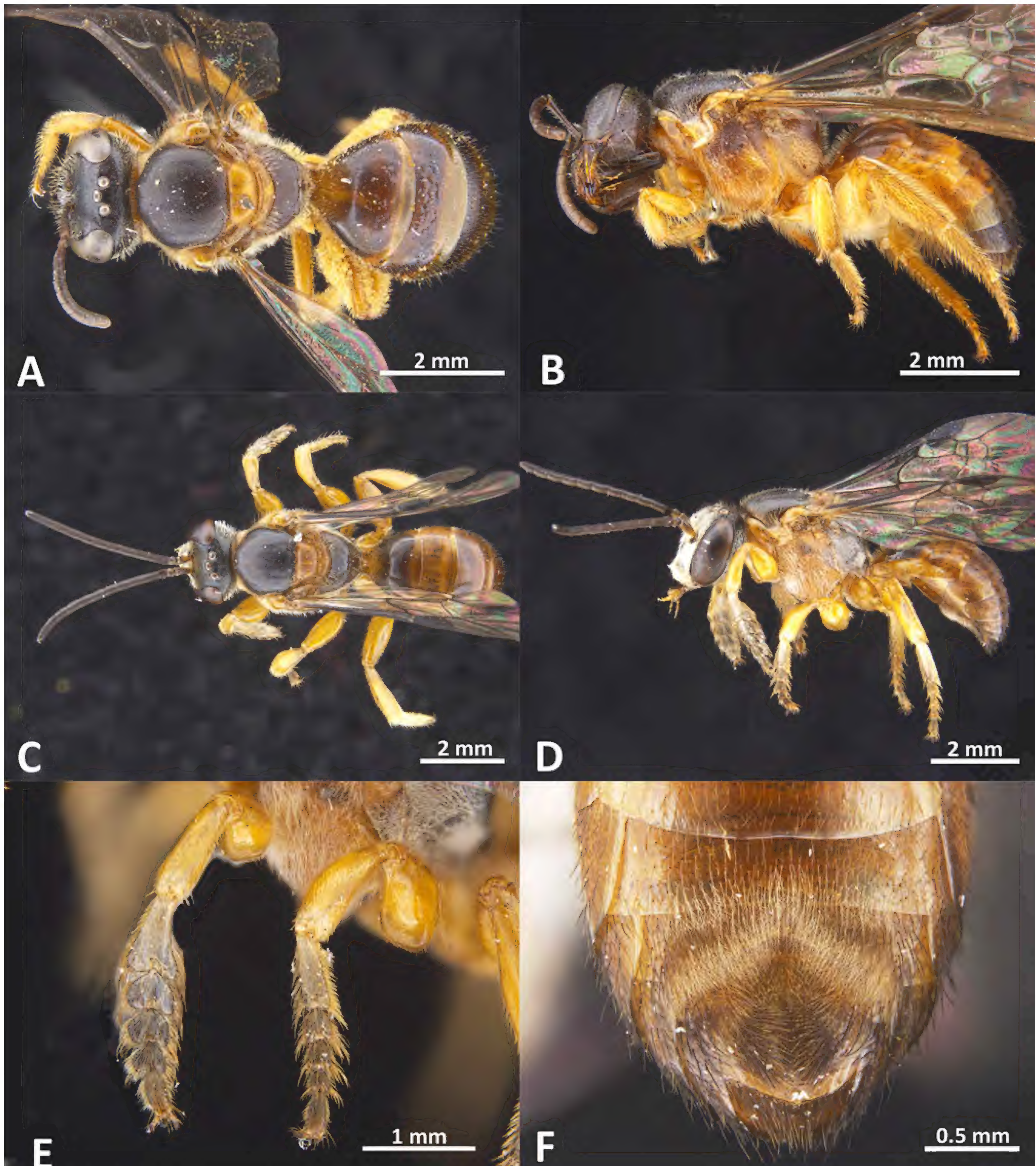


Figure 5. *Lasioglossum (Callalictus) musgravei* A-F: A, dorsal female; B, lateral female; C, dorsal male; D, lateral male; E, male fore and mid tarsal segments; F, male sternal vestiture.

lateral spiracle cover, dense cover of minute, adpressed white hair on lateral margins of propodeum.

Description of male: (Figs 5C-D, 6) Body length: 9.11 mm (n=1); forewing length: 2.26 mm (n=1); head width: 2.06 mm (n=1); intertegular distance: 1.39 mm (n=1). Relative head measurements: HW: 100, HL: 95, UID: 49, LID: 40, IAD: 08, OAD: 27, IOD: 15, OOD: 09, CL: 27, GW: 14, EW: 40, SL: 22, AS4/AS2+3 (20/15) 1.3, FL: 172. *Differs from female as.* Inner eyes converging below; Medi-

an frontal carina reaching just above upper antennal insertion points; frons sculpture reticulate across surface except smooth along inner margins of eyes; scape reaches well below level of median ocellus; clypeus surface dull, divided into two sections, section below the supraclypeal area about one third length of clypeus continues contours, section two about two thirds length of clypeus almost at right angle to section one leading back to the base of the labrum; mesoscutum surface dull, covered with microtessellate pattern, mesially openly



Figure 6. *Lasioglossum (Callalictus) musgravei* male live showing flanged tarsal segments. Location: Tomewin, NSW December 2021, on flowers of *Delarbrea michieana*. Image credit and copyright to Marama Hopkins.

punctate, openly punctate towards parasidal areas, in parasidal areas densely punctate, punctures minute; scutellum dull, distinctly bi-bulbous, openly to closely punctate with small, shallow punctures; dorsal surface of propodeum acarinate; legs with fore tarsal segments horizontally compressed, flattened, apically bilobed and weakly convex dorsally, mid tarsal segments with similar shape but to lesser extent to fore tarsal segments (forebasitarsus and midbasitarsus width versus length ratio as 0.6), tarsal segments with lateral hair tufts (Figs 5D–E, 6), ventral surface of fore and mid tarsal segments dark coloured but with pale white line running down the middle of each segment, mid tarsal segments similar to fore tarsi but to a lesser degree, fore and mid femora swollen mesially, fore femora more so; colour similar to female, head black, pronotum, mesepisternum and metepisternum light red-brown, propodeum black, legs bright ochre coloured, metasoma with T1 and T4–T5 dark brown to black, T2–T3 ochre coloured. *Vestiture*. Head with dense cover of adpressed hair in paraocular

areas and up frons to level of medium ocellus, forming a dense matt, mesepisternum with some long hairs basally, propodeum laterally with dense cover of short adpressed hair, mesosoma with sparse cover of erect hair, mesoventral area with tufts of long backwardly directed hair basally, metasomal sternal S3 straight across apical margin, S4 concave across apical margin, S3 vestiture with a medium cover of backwardly directed plumose branched hair, mesially hairs longer and reaching S4 hairs, S4 with dense cover of V-shaped cover of plumose branched, backwardly directed hair across sternite, S5 with moderate cover of inwardly pointed hairs, S6 with sparse cover of hair inwardly pointed to the midline (Fig. 5F).

Genitalia and associated sterna. (Figs 2E–F) Gonobase sides parallel to slightly narrowed basally, complete ventroapically, gonobase width almost half of gonocoxite width, gonocoxite glabrous, dorsal inner margins of gonocoxite basally broadly truncate; apical inner margin not produced and continues contours of gonostylus,

glabrous; retrorse lobes large, almost meeting at midline, membraneous and pointing towards midline; outer margins and inner margins of retrorse lobes glabrous; gonostyli erect, distally large and tapered and rounded distally, with dense cover of long, simple, erect hair, length of hairs at least one third width of gonobase, hairs of two different lengths, most hairs about equal length except a few distal hairs about 1.5 length of other hairs, hairs distally curved inwardly towards midline; penis valves strongly curved apically, with short dense cover of hair dorsolaterally.

Other specimens examined (6♀; 1♂)

QUEENSLAND: (1♀) Eungella Nat. Pk, 16–19 Oct 1979 HB & MA Evans (QM)

NEW SOUTH WALES & AUSTRALIAN CAPITAL TERRITORY: (1♂) Eden Rd, Tomewin, 17 Dec 2021, on flowers of *Delarbrea michieana* Marama Hopkins (NMV); (4♀) Gibraltar Range Nat. Pk, 15–17 Nov 1979, N.W. Rodd (AM); (1♀) Dorrigo Nat. Pk, 17 Nov 1980, N.W. Rodd (AM)

Images only: (1♂) Eden Rd, Tomewin, 17 Dec 2021, on flowers of *Delarbrea michieana* Marama Hopkins. Facebook link: <https://www.facebook.com/photo/?fbid=10160029068768854&set=pcb.3078069862433295>; (1♀) Eden Rd, Tomewin, 25 Oct 2021, Marama Hopkins. Video of female bee collecting pollen: <https://www.flickr.com/photos/190704092@N07/51626920333/in/album-72157720111971722/>

Floral Record. Family Visited: 1 (Myodocarpaceae (1)). Genus Visited: 1 (*Delarbrea* (1))

Flight Phenology capture records. Jan (0) Feb (0) Mar (0) Apr (0) May (0) June (0) July (0) Aug (0) Sept (0) Oct (1) Nov (4) Dec (1)

Distribution. Sporadic collections from Central Queensland (Eungella Nat. Pk near Mackay) down to Dorrigo Nat. Pk (near Grafton) NSW (Fig. 1C).

Remarks. The single male specimen collected is distinctly larger than any known female. It was photographed (Fig. 6) and collected at Tomewin, NSW flying with females of *Lasioglossum musgravei*. The male ocelli appear slightly enlarged as is typically found in low-light bees. *Lasioglossum musgravei* resembles *L. aurantiacum* but can be separated by different body colour markings and subtle gonostyli hair length male genitalia characters.

Lasioglossum (Austrevylaeus) contaminatum (Cockerell)

(Figs 1D, 7A–F)

Parasphecodes contaminatus Cockerell 1910: 238; Meyer, 1920: 136.

Lasioglossum (Callalictus) contaminatum - Michener 1965: 170.

Lasioglossum (Austrevylaeus) contaminatum - **comb. nov.**

Material examined. Holotype of *contaminatus* ♂, Queensland, Cairns (typed), Kuranda (handwritten on same card) Jan 1902, Turner collection 1910-17 - BMNH Hym.17.a.625 (BMNH)

Diagnosis

Lasioglossum (Austrevylaeus) contaminatum is distinguished in both sexes from other *Austrevylaeus* species by the primarily ochre body colour except for a brown head. The head is densely covered with short, white, adpressed hair and the mesoscutum has a distinctive vestiture of short, white, adpressed hair in a U shaped pattern (Figs 7A–E, F). *Lasioglossum contaminatum* body is relatively smooth with microtessellate sculpture and minute punctures on the mesoscutum. The dorsal surface of the propodeum is smooth and acarinate.

Description of female. (Figs 7A–B) Body length 7.08–7.20–7.31 mm (n=2); forewing length 2.12–2.13–2.14 mm (n=2); head width 1.81–1.84–1.88 mm (n=2); intertegular distance 1.67–1.675–1.68 mm (n=2). Relative head measurements: HW: 100, HL: 93–84, UID: 52–53, LID: 40–41, IAD: 06–07, OAD: 28–29, IOD: 15–16, OOD: 13–14, CL: 30–31, GW: 14–15, EW: 34–35, SL: 40–42, FL: 95–97. *Head.* Elongate (Fig. 7A), inner eyes converging below; median frontal carina reaching half way to median ocellus; clypeus polished on anterior one half, remainder dull on posterior half covered with microtessellate sculpture, anterior half with several large, irregular shaped punctures, posteriorly sparsely punctate mesially, closely to densely punctate laterally with small, rounded punctures, supraclypeal area dull, covered with microtessellate sculpture, sparsely punctate across surface with small rounded punctures; frons sculpture difficult to view as completely covered with hair. *Mesosoma.* Pronotum dorsolateral angles small and rounded in dorsal and lateral views; mesoscutum anterior mesial margin weakly produced mesoanteriorly, surface dull, appears impunctate but openly to sparsely punctate with weak punctures, entire surface covered with a fine, microtessellate sculpture; scutellum length equal to length of dorsal surface of propodeum, scutellum rounded, not bi-bulbous, closely punctate along midline, remainder openly punctate, surface dull; dorsal surface of propodeum acarinate though with black line across posterior margin, no distinct dorsal rim, horizontal dorsal surface of propodeum V-shaped, laterally remainder of dorsal surface curve steeply on to vertical surface giving a "saddle-like" appearance, lateral margin smooth, dorsal surface microtessellate with several weak striae mesially, sculpture not reaching to posterior rim, lateral margins microtessellate only; mesepisternum striolate, metepisternum smooth and openly punctate; second submarginal crossveins (1st r-m) weaker than the first submarginal crossvein (Fig. 7E). *Metasoma and legs.* Metasomal T1–T5 smooth, shining, T1–T2 closely punctate with minute punctures, T3–T5

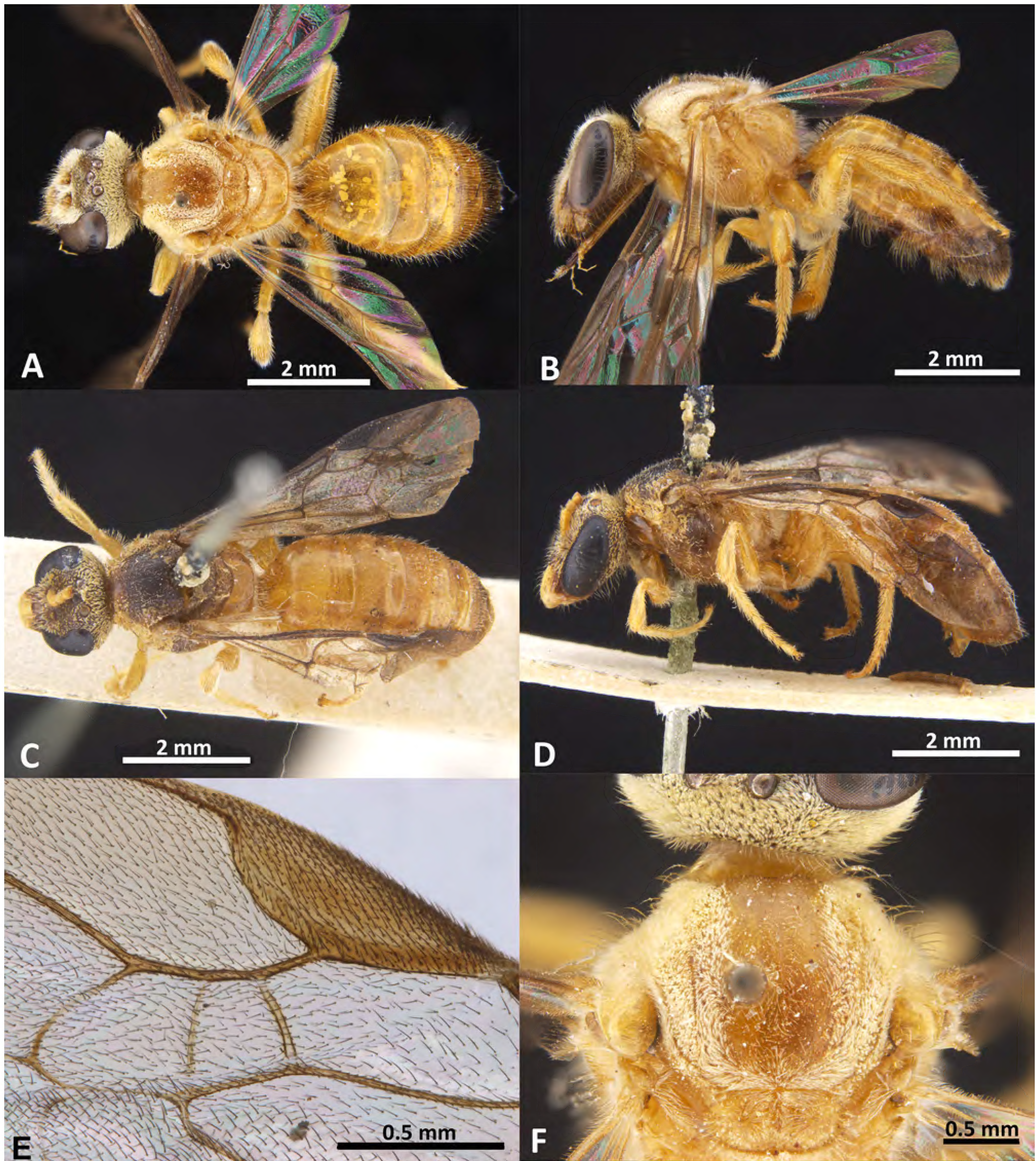


Figure 7. *Lasioglossum (Austrevylaeus) contaminatum* A–F: A, dorsal female; B, lateral female; C, dorsal male; D, lateral male; E, female forewing submarginal cells; F, female vestiture on head and mesoscutum.

impunctate; inner hind tibial spur finely serrate, hind basitibial plate pointed.

Colour. (Figs 7A–B) Body entirely ochre coloured except, clypeus cream coloured, T4–T5 darkened but not entirely black.

Vestiture. Frons, interantennal space, paraocular areas, occiput and genae densely covered with white, adpressed hair, clypeus and supraclypeal area almost glabrous; mesoscutum mesially glabrous, laterally to

parasidal lines, along posterior margin and in parasidal areas densely covered with U shaped, white, adpressed hair (Fig. 7F); mesepisternum anteriorly, metanotum mesally, lateral sides of propodeum densely covered with white, adpressed hair; T1–T2 almost glabrous, T3–T5 with scattered, sparse erect hairs.

Description of male. (Figs 7C–D) Body length 7.55 mm (n=1); forewing length 1.52 mm (n=1); head width: 1.68 mm (n=1); intertegular distance: 1.25 mm (n=1). Relative

head measurements: HW: 100, HL: 107, UID: 46, LID: 34, IAD: 09, OAD: 32, IOD: 18, OOD: 13, CL: 32, GW: 16, EW: 36, SL: 28, FL: flagella segments missing. Differs from female as follows: Head longer than wide, inner orbits strongly converging below, eyes (in side view) bulbous; frons finely reticulate; clypeus, in side view, weakly convex, strongly produced beyond level of lower margins of eye, shining, openly to closely punctate, colour entirely white-yellow, closely punctate; mesoscutum anterior margin of mesoscutum weakly produced and bilobed, mesially openly punctate, mesiad of parapsidal lines closely punctate, parapsidal area openly punctate; scutellum raised, weakly bilobed, closely punctate; entire body ochre light red-brown except frons, supraclypeal area, mesoscutum, wings brown; dorsal surface of propodeum posterior margin acarinate, dorsal surface smooth; terga sparsely to openly punctate with minute punctures; vestiture hirsute as in female except dense hair on frons, genae and occiput and metanotum, lateral margins of propodeum with weak cover of hair, hair tufts laterad of midline on S5. *Genitalia and associated sterna*. Previously removed and lost.

Other specimens examined (2♀; 1♂)

QUEENSLAND: (1♂) same data as Holotype except Turner collection 1912-111 (genitalia had been removed and lost) (SEM); (1♀) Millaa Millaa Falls, 4 Jan--7 Feb 1990, Storey & Halfpapp (QDPI); (1♀) Mt. Lewis nr Mossman, 10 June 1985, N.W. Rodd (AM)

Flight Phenology capture records. Jan (2) Feb (1) Mar (0) Apr (0) May (0) June (1) July (0) Aug (0) Sept (0) Oct (0) Nov (0) Dec (0)

Distribution. This species is known from only three localities in North Queensland (Fig. 1D).

Reason for systematic change. In both sexes, though more so in the female, the second submarginal (1st r-m) vein is weaker or narrower than the first transverse cubital vein (Fig. 7E). In the female, the pronotum dorso-lateral angles are small and rounded and the inner hind tibial spurs are finely serrate – all characters that define the subgenus *Austrevylaeus* rather than *Callalictus* where Michener (1965) placed this species.

Notes. There is an undescribed *Austrevylaeus* species from north Queensland with similar body colours; however, this species has almost no vestiture on the head or mesoscutum, readily separating it from *Lasioglossum* (*Austrevylaeus*) *contaminatum* (Fig. 7F).

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